

# Earthquakes and the rebuild of Christchurch: how Geography provides the answers

Professor Simon Kingham

Dept of Geography, University of Canterbury

Director of The Geospatial Research Institute and the GeoHealth Laboratory

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Cashmere High School, August 2016

# The importance of the 'whole'



People: political boundaries, socio-economic, cultural, age, gender places

Infrastructure: buildings, transport, water systems, energy, waste

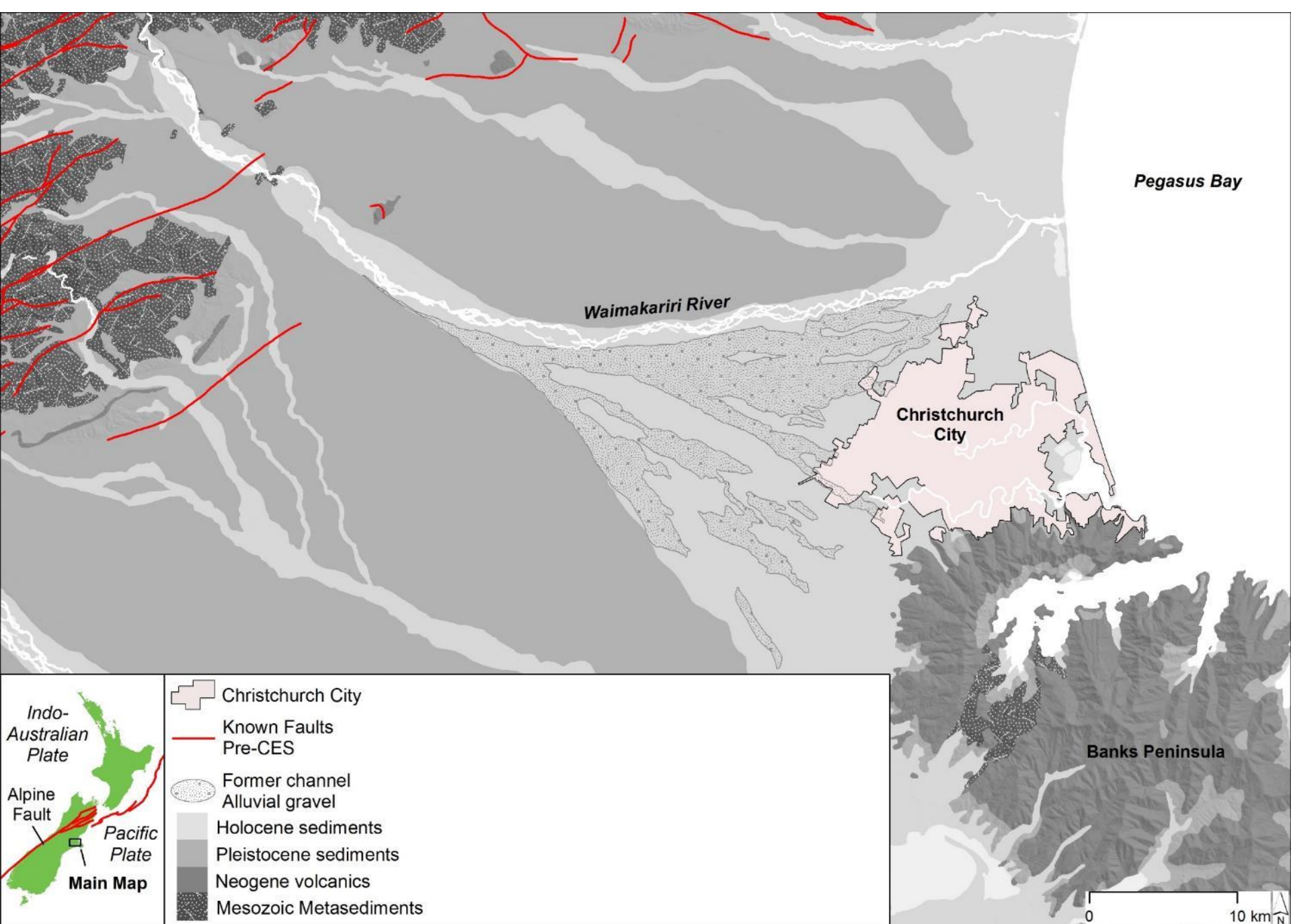
Earth System: geology, tectonics, materials

Environment: land use, ecology, green space, waterways

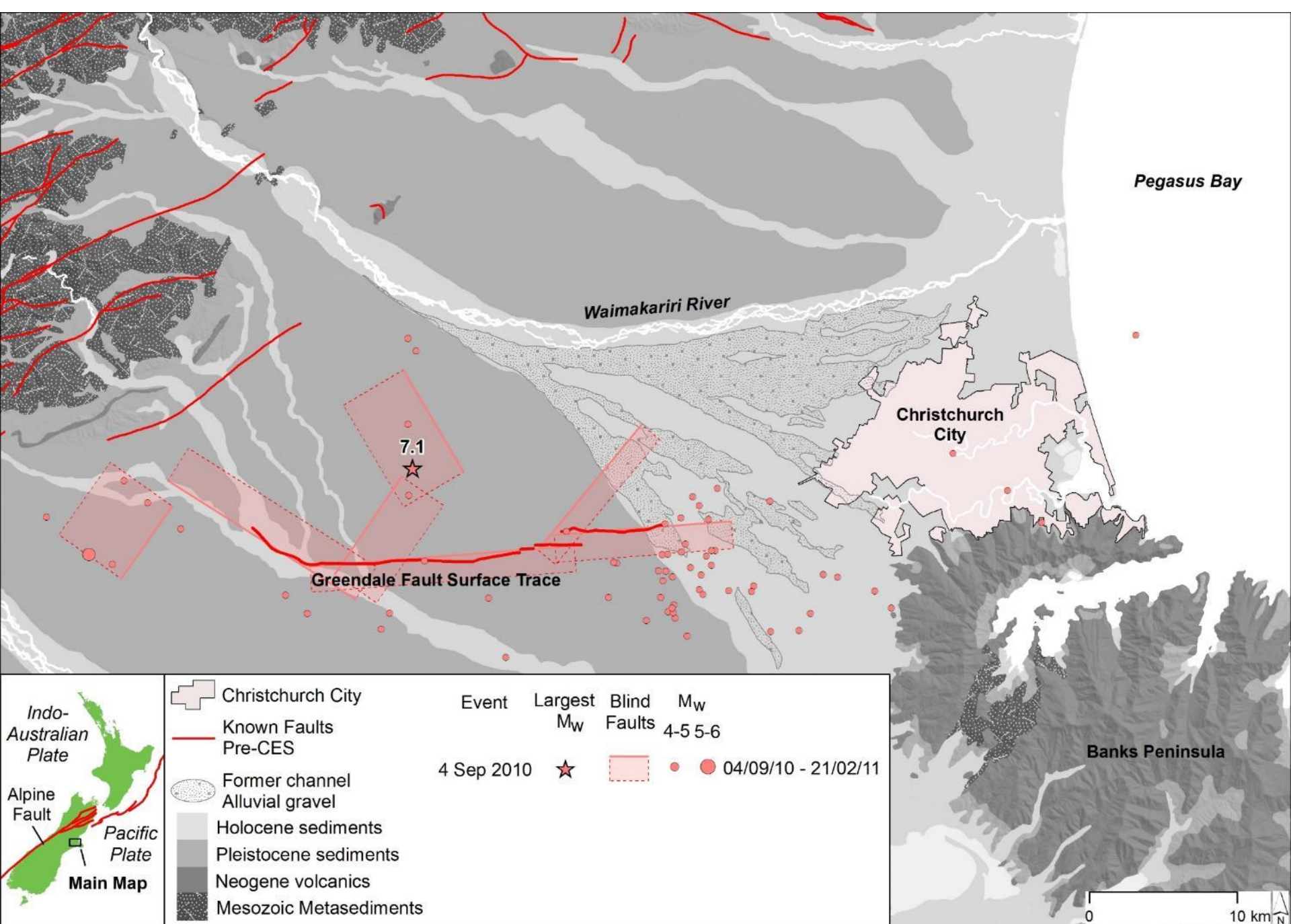
Time: past, present & future people & places

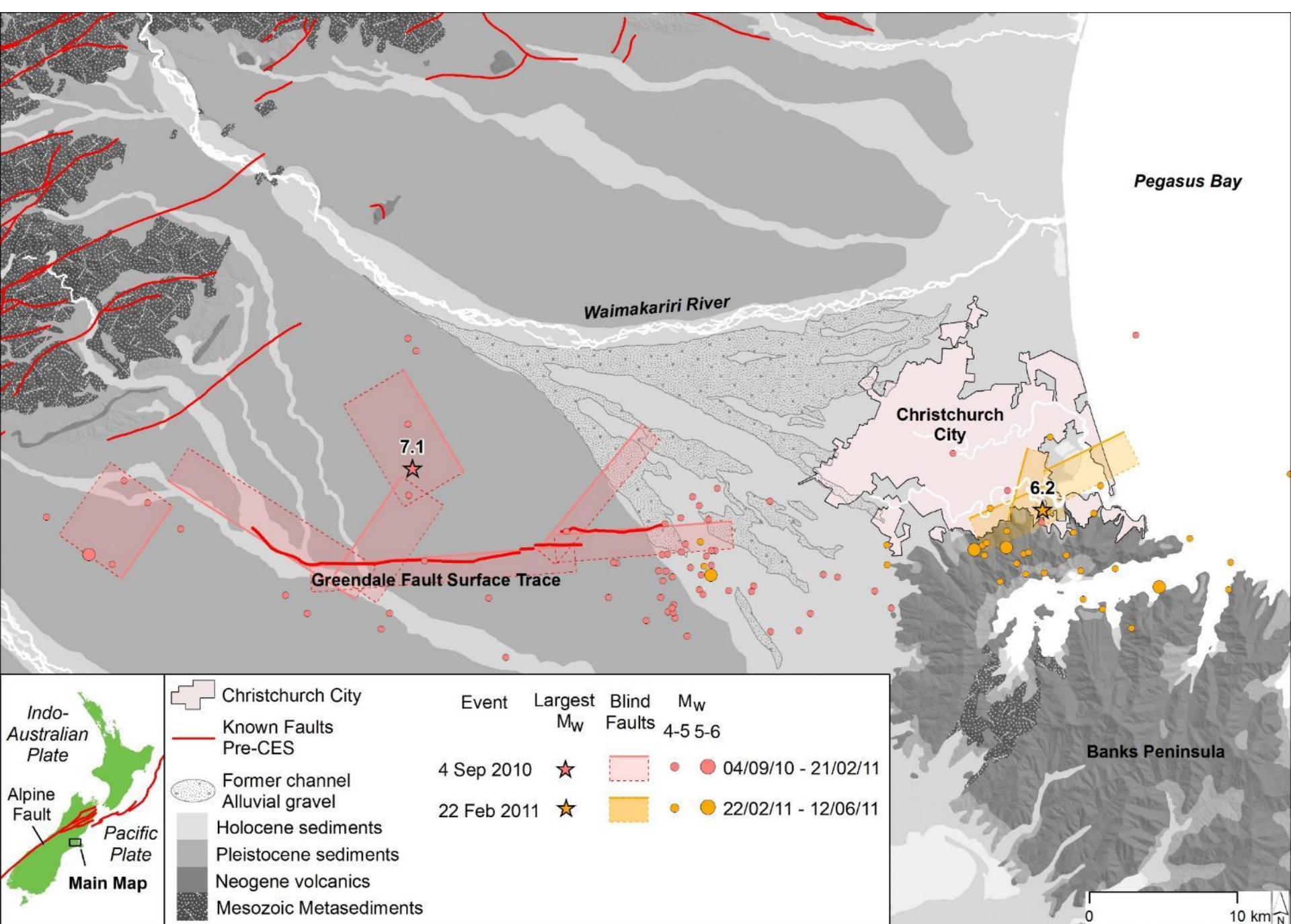
Real world: complex, interrelated & interdependent 'neural network' of physical, built & human environments

# EARTHQUAKE DAMAGE – WHERE?

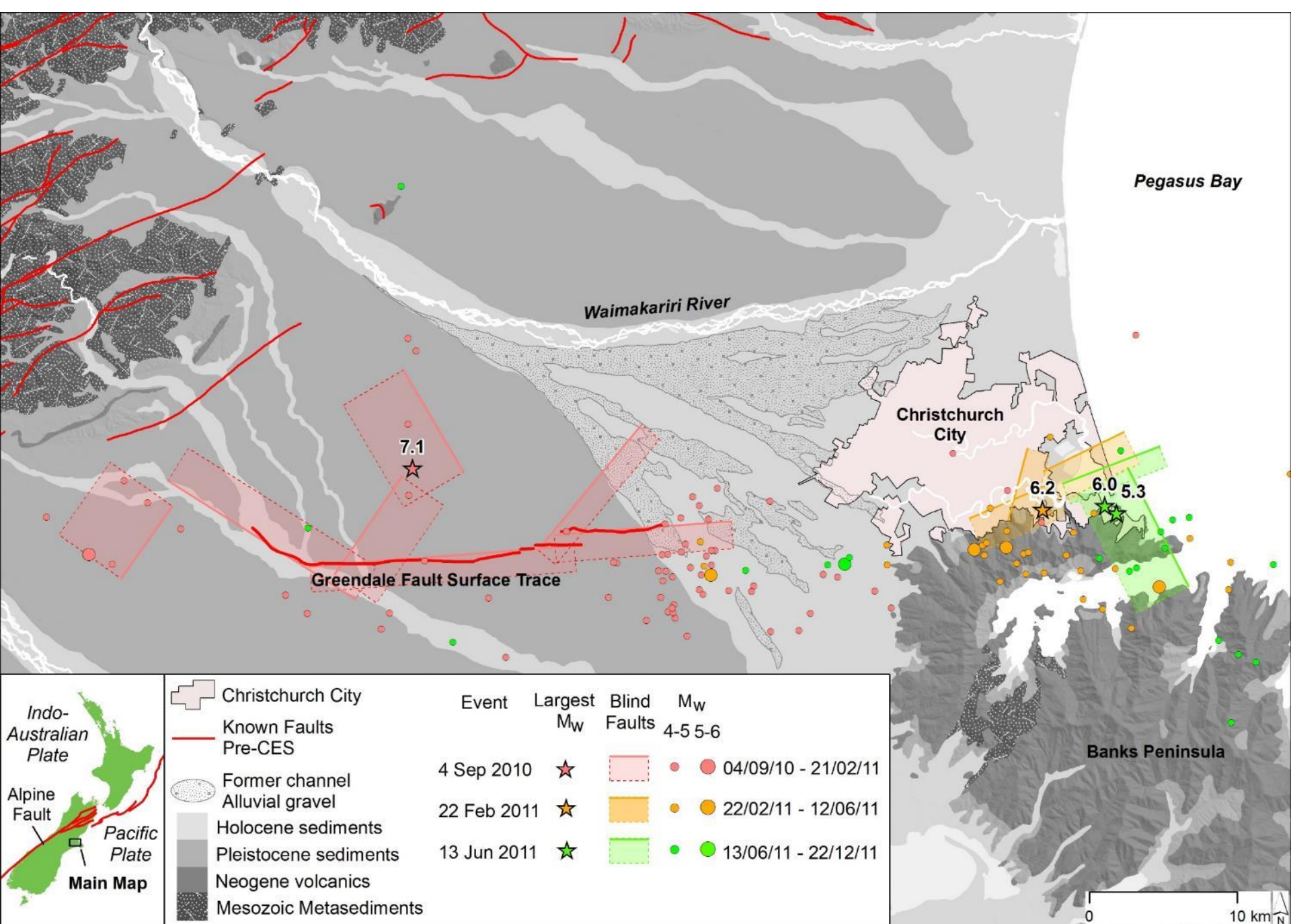


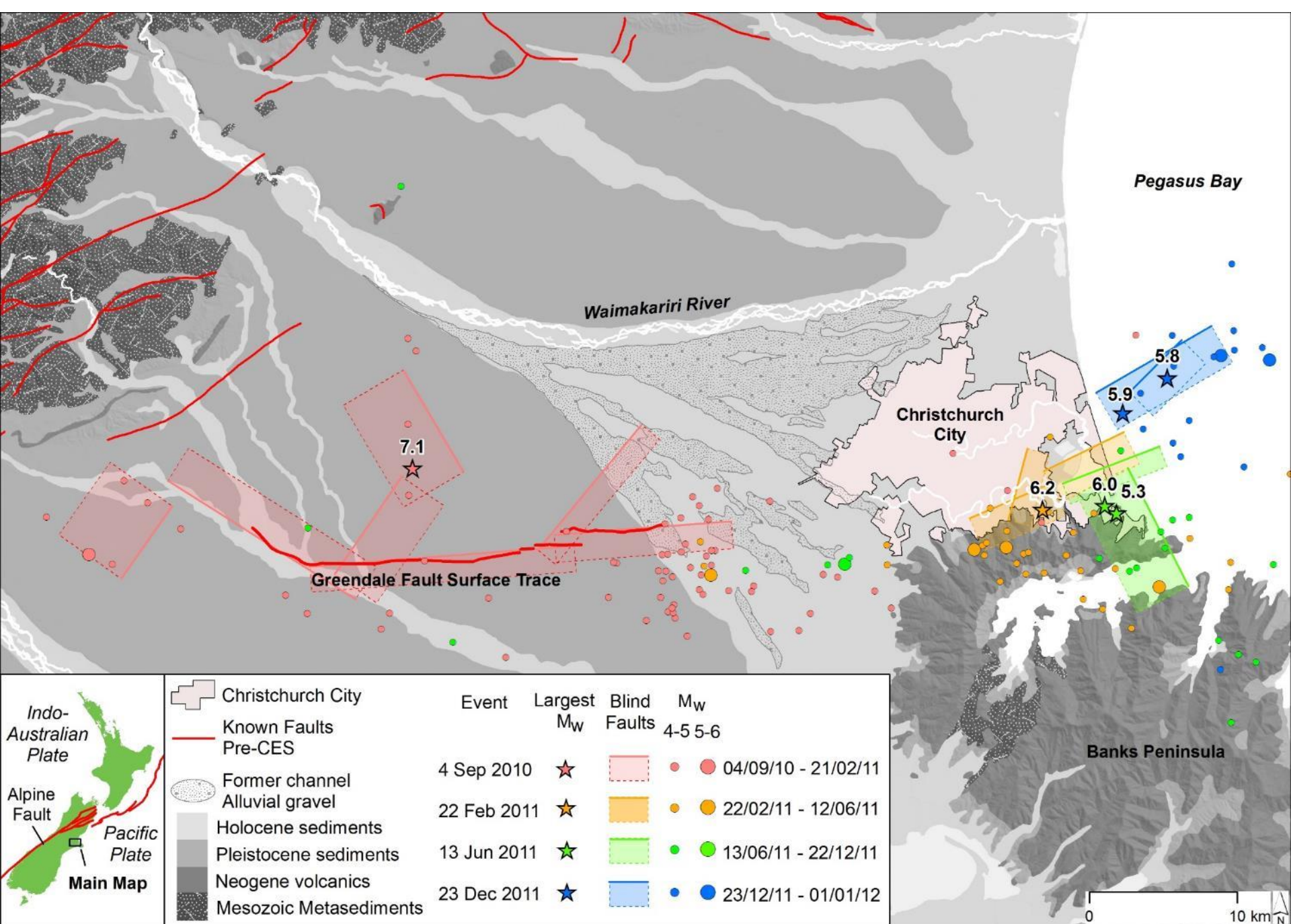














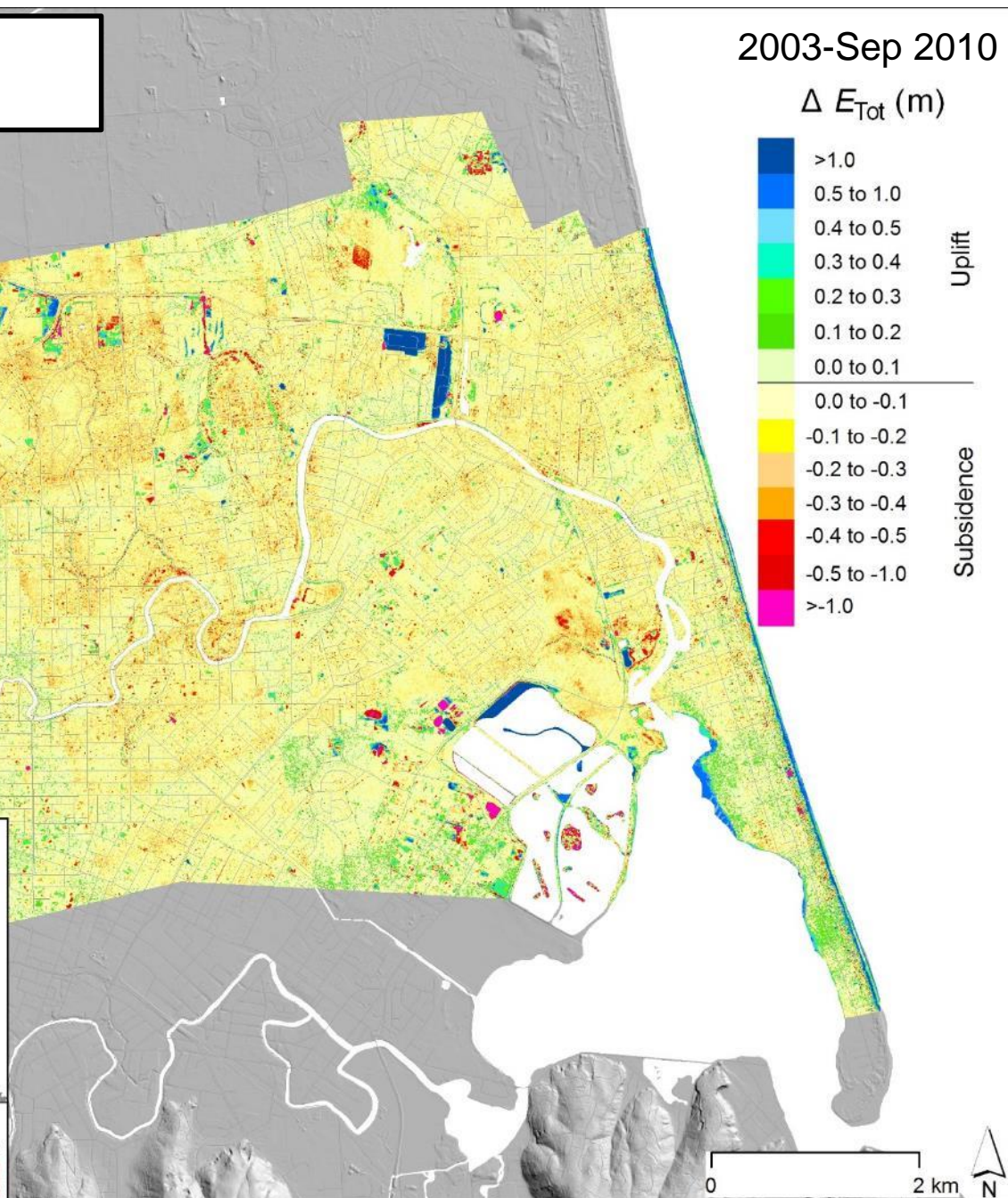
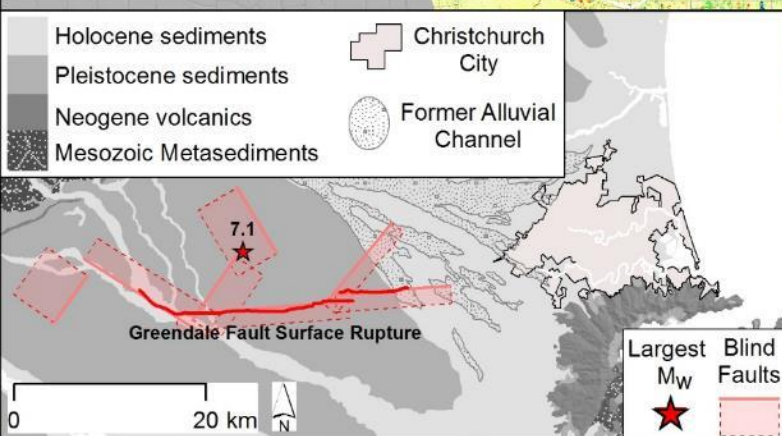
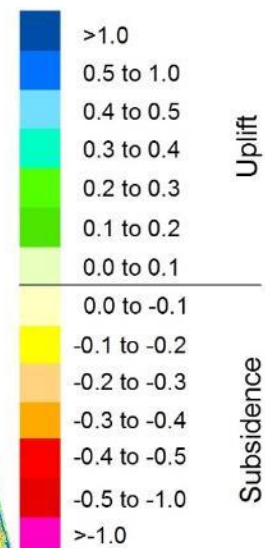
# EARTHQUAKE DAMAGE – WHAT?

4 Sep  
2010



2003-Sep 2010

$\Delta E_{\text{Tot}}$  (m)



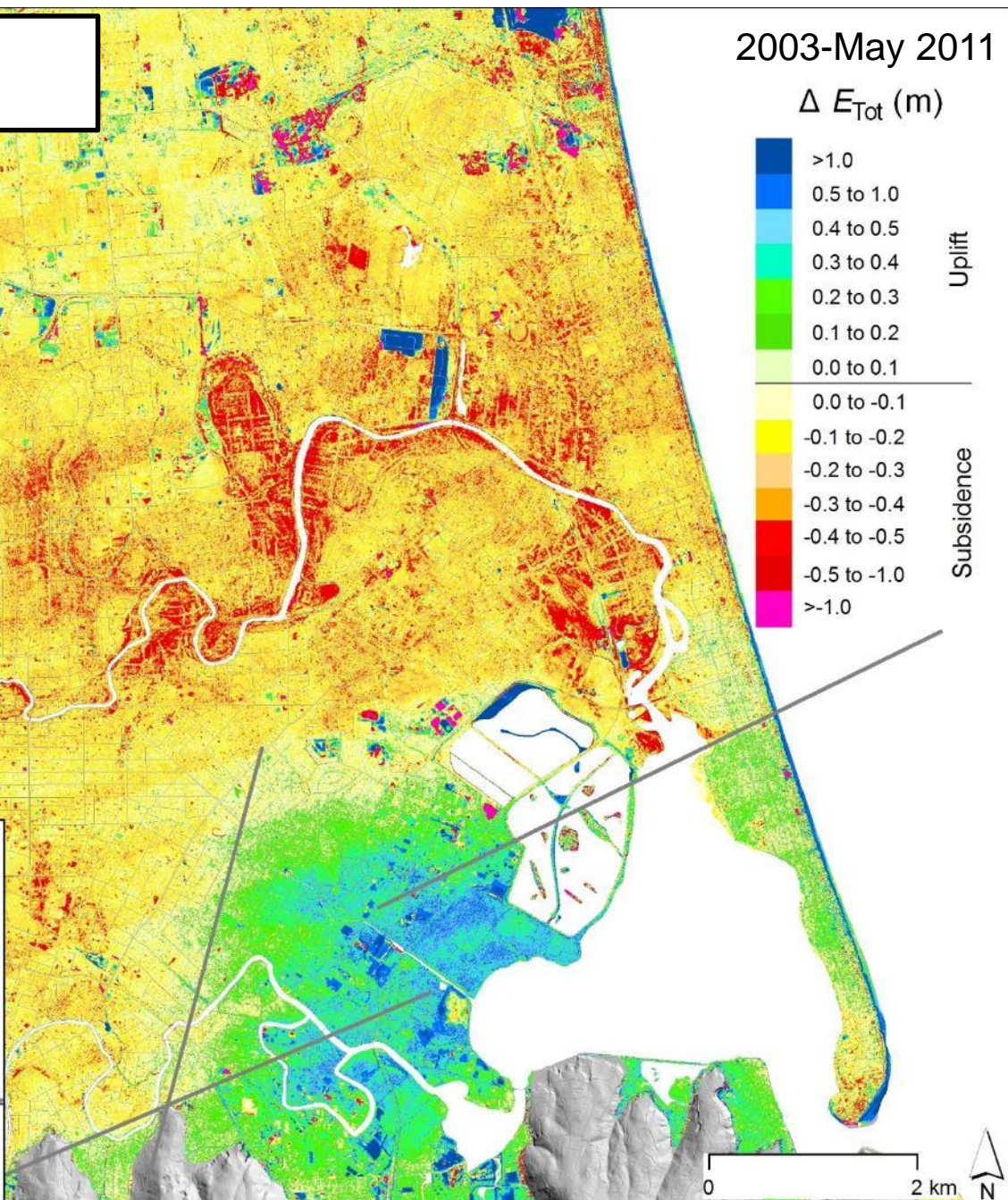
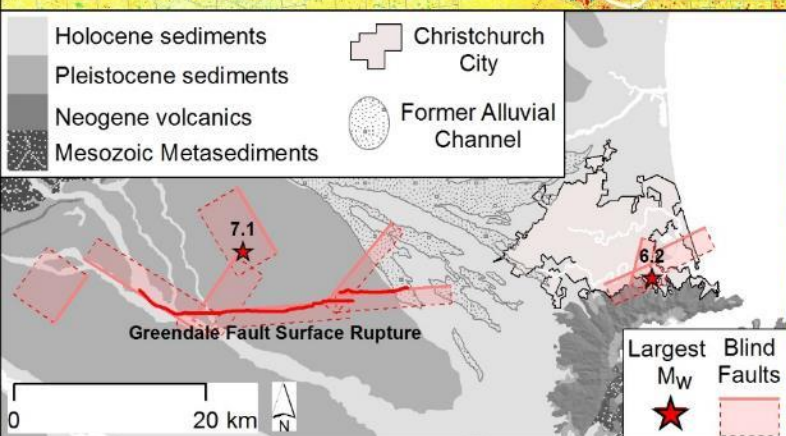
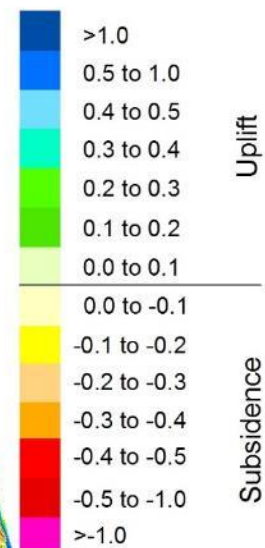


4 Sep 2010 22 Feb 2011

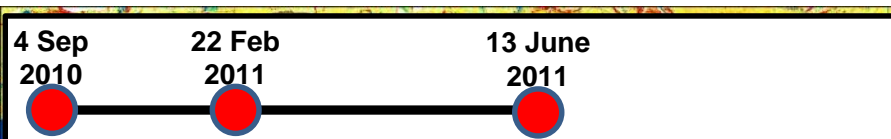


2003-May 2011

$\Delta E_{\text{Tot}}$  (m)

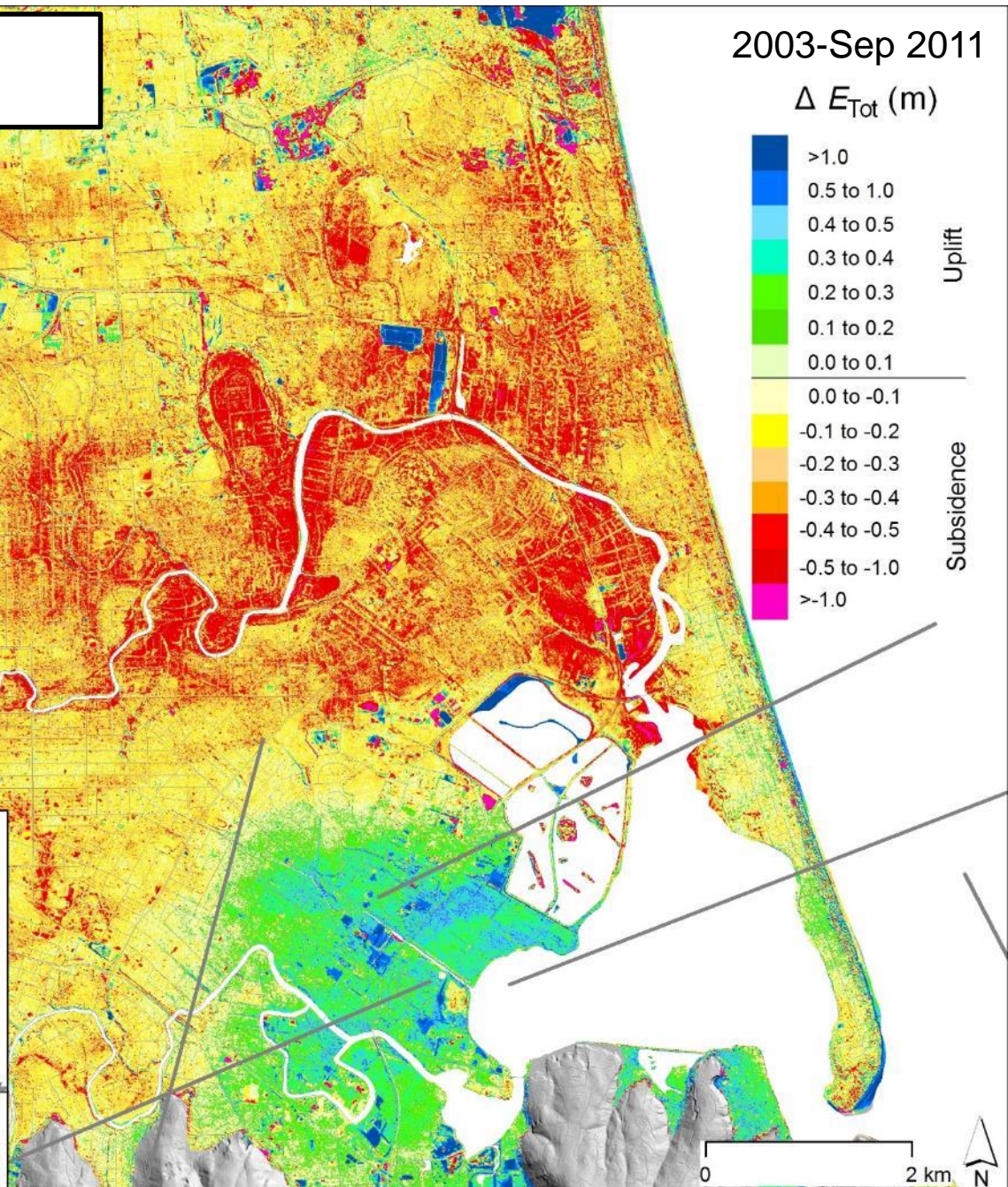
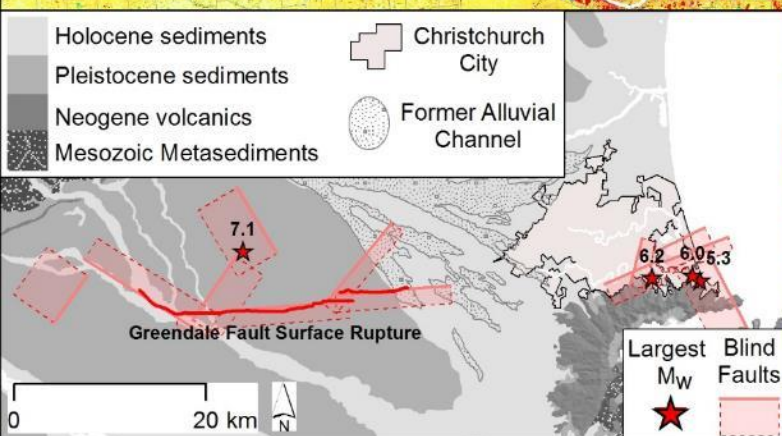
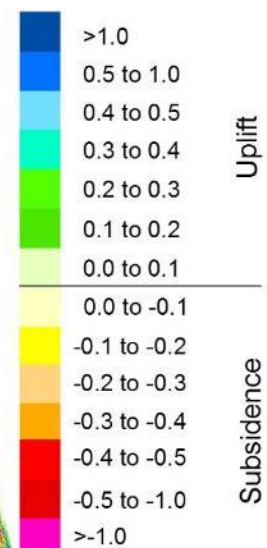




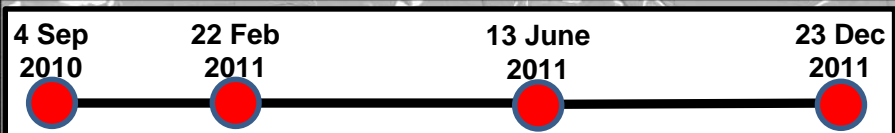


2003-Sep 2011

$\Delta E_{\text{Tot}} \text{ (m)}$

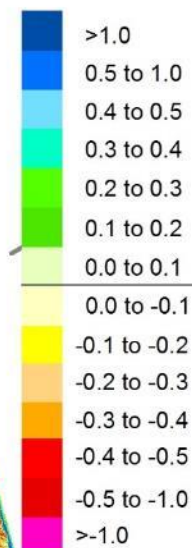






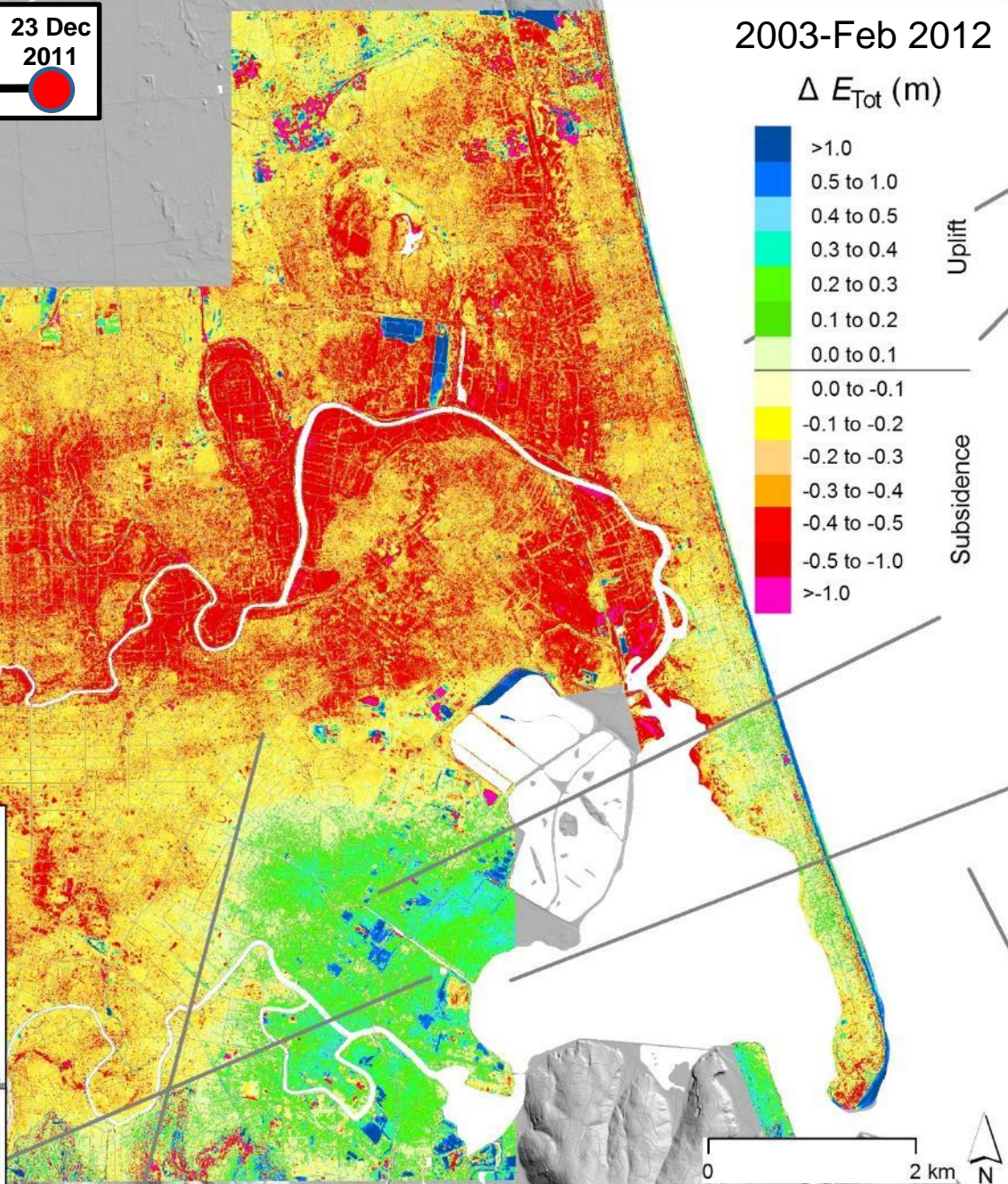
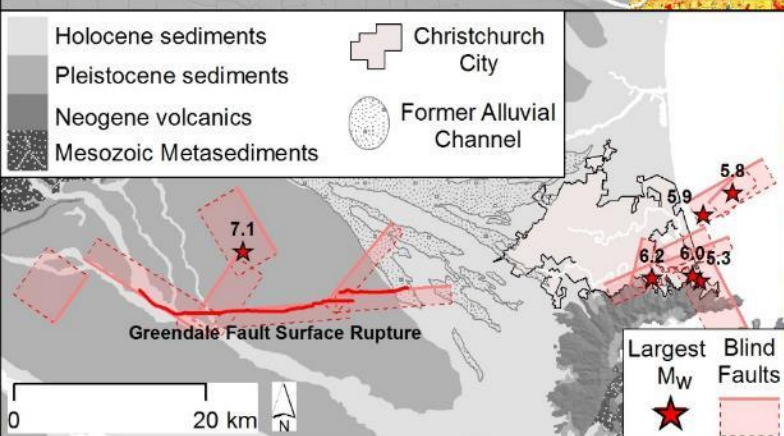
2003-Feb 2012

$\Delta E_{\text{Tot}}$  (m)



Uplift

Subsidence

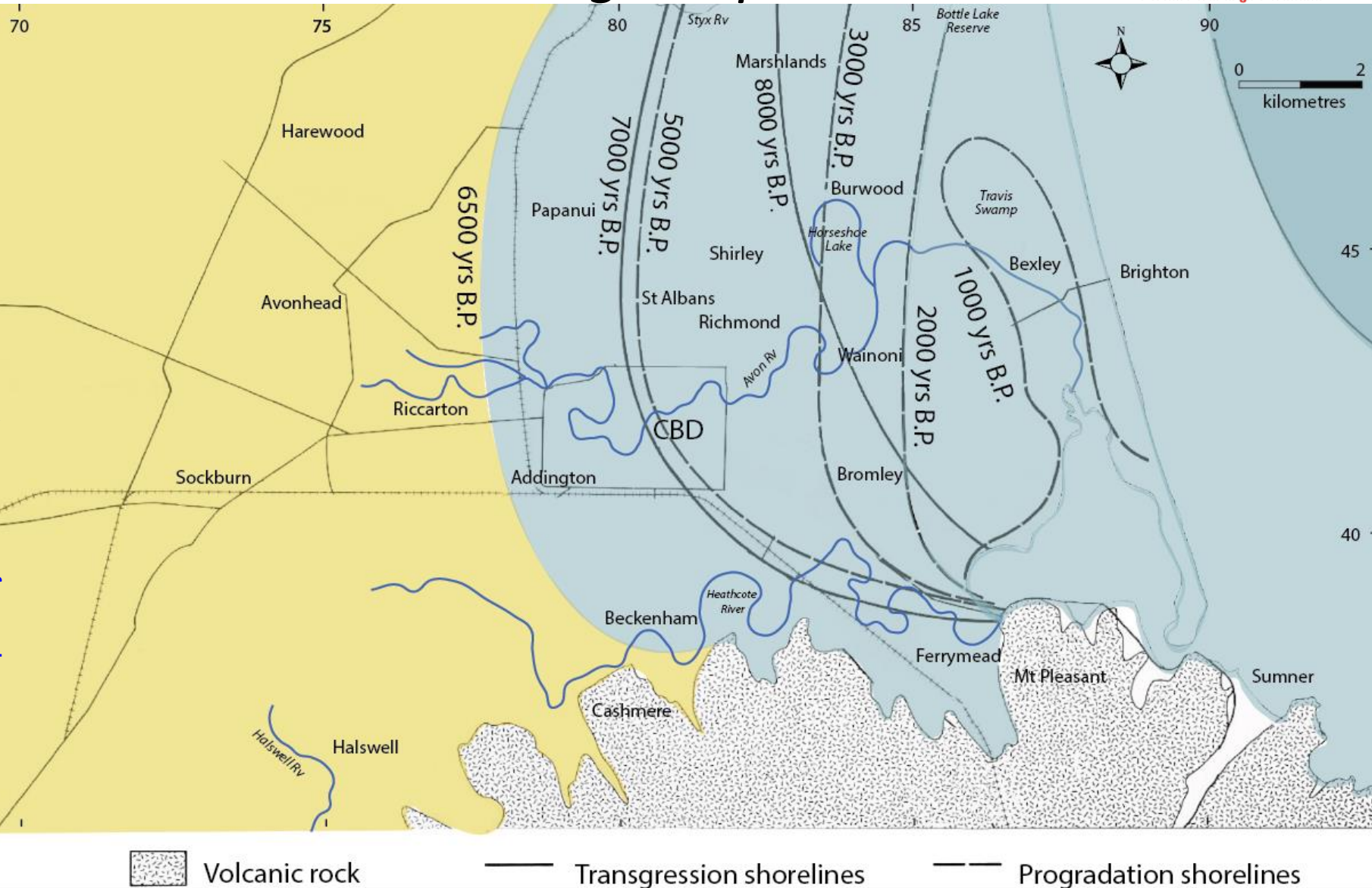


# EARTHQUAKE DAMAGE – WHY?



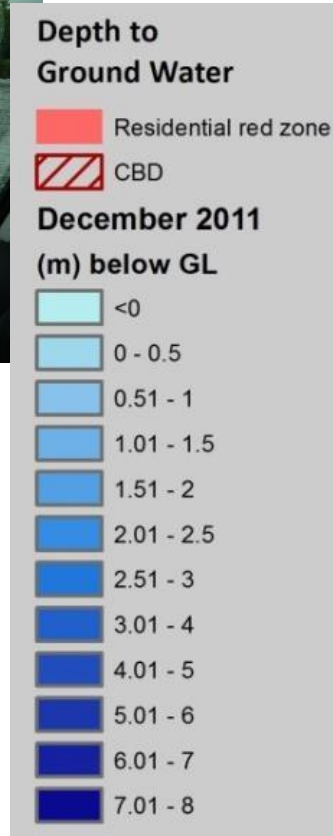
# Rebuilding a resilient city *involves understanding the past*

Graphic by M Brosnan, after Brown & Webber 1992

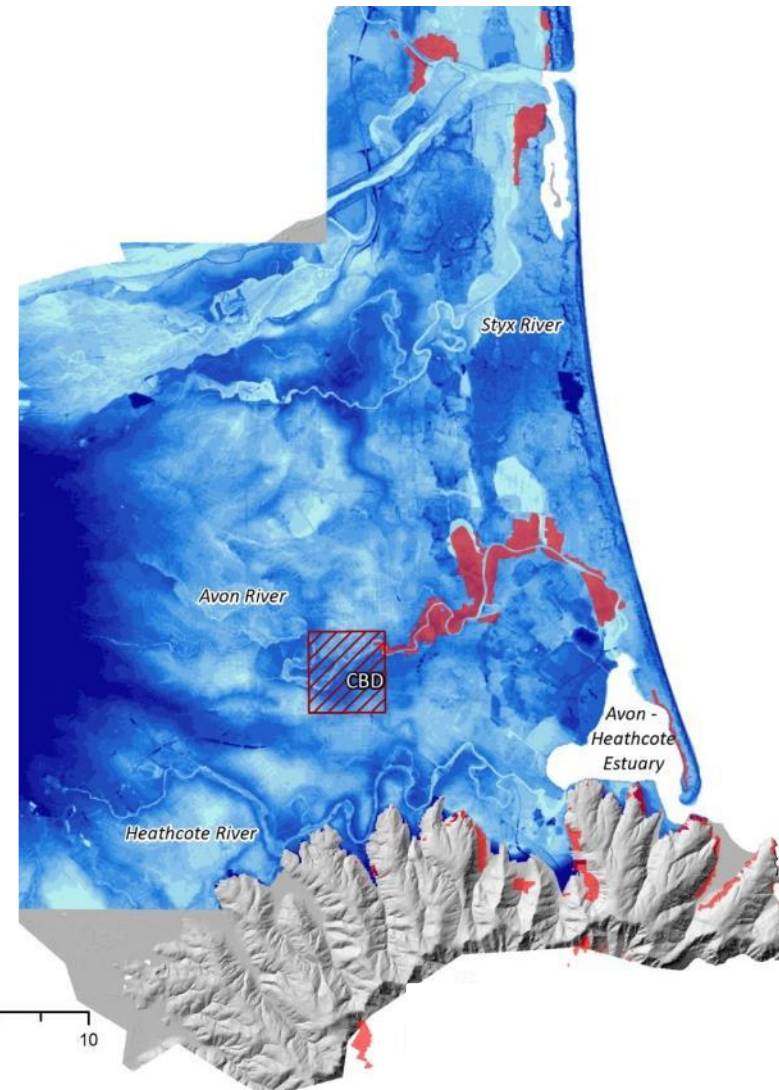


# Rebuilding a resilient city

*involves understanding the present*



e.g. flooding: land, channels & pipes







Rebuilding a resilient city  
*involves understanding the future*



# What are key features of geography?

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- in context of rebuild

# The power of where



## ‘The power of where’ drives New Zealand’s success

Land Information New Zealand (LINZ) makes a significant contribution to the smooth running and development of New Zealand.

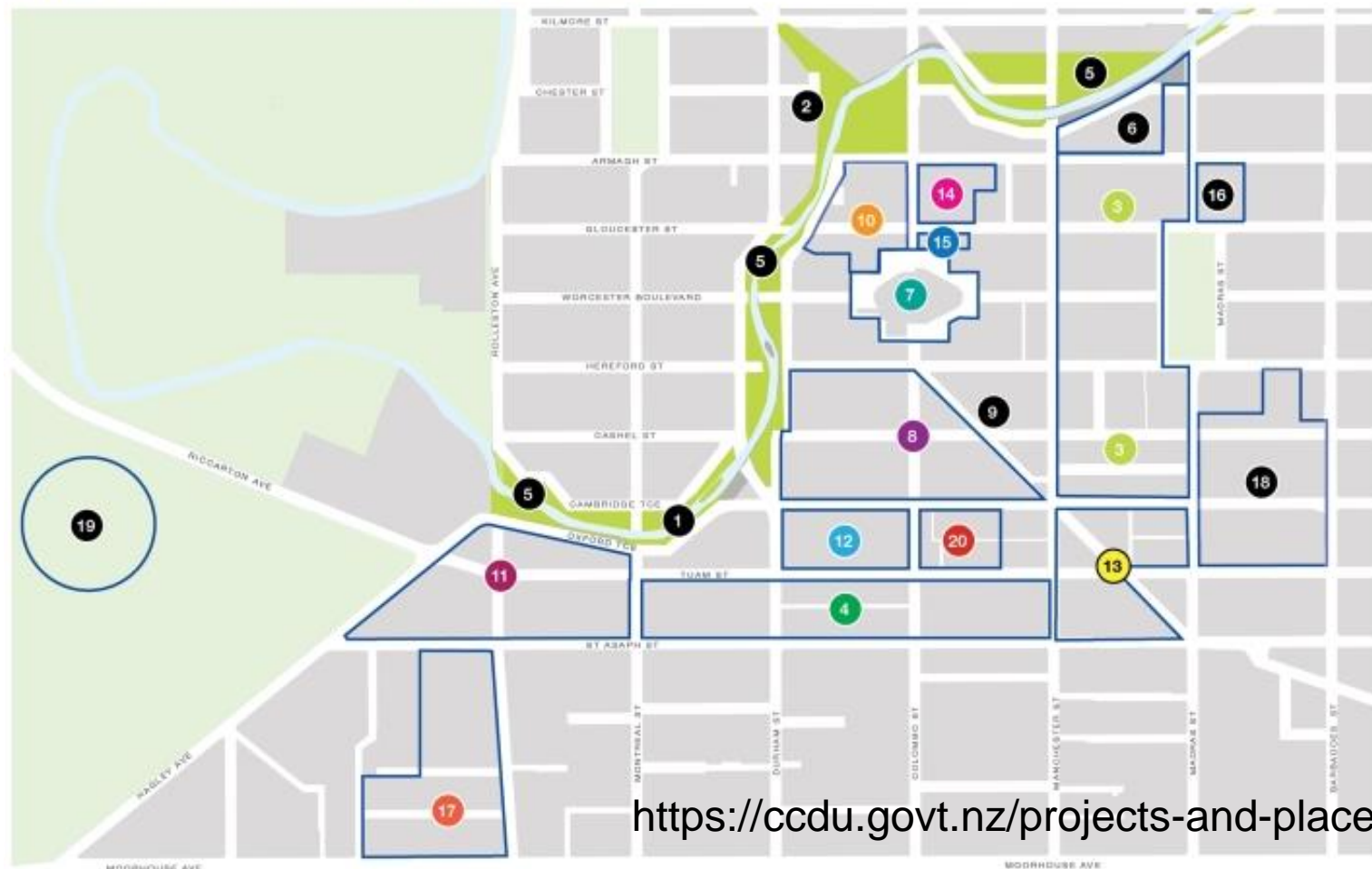
So many decisions involve information about location– from finding the best use for farmland, to deciding where to build a school, to planning underground infrastructure maintenance, to deciding which route to take to work. This is information that LINZ provides.

Decisions using location information already add \$1.2 billion to New Zealand’s economy. LINZ’s vision is to increase this value by tenfold over the next decade. We call this ‘the power of where’.

# The anchor projects

## Projects and Places

The Recovery Plan identifies the location of major anchor projects: key developments in Christchurch's central city. The anchor projects inspire confidence and give momentum to the inner city rebuild. Each project provides opportunities for individuals and organisations to be part of the city's future.



<https://ccdu.govt.nz/projects-and-places>



# The anchor projects



## Projects and Places

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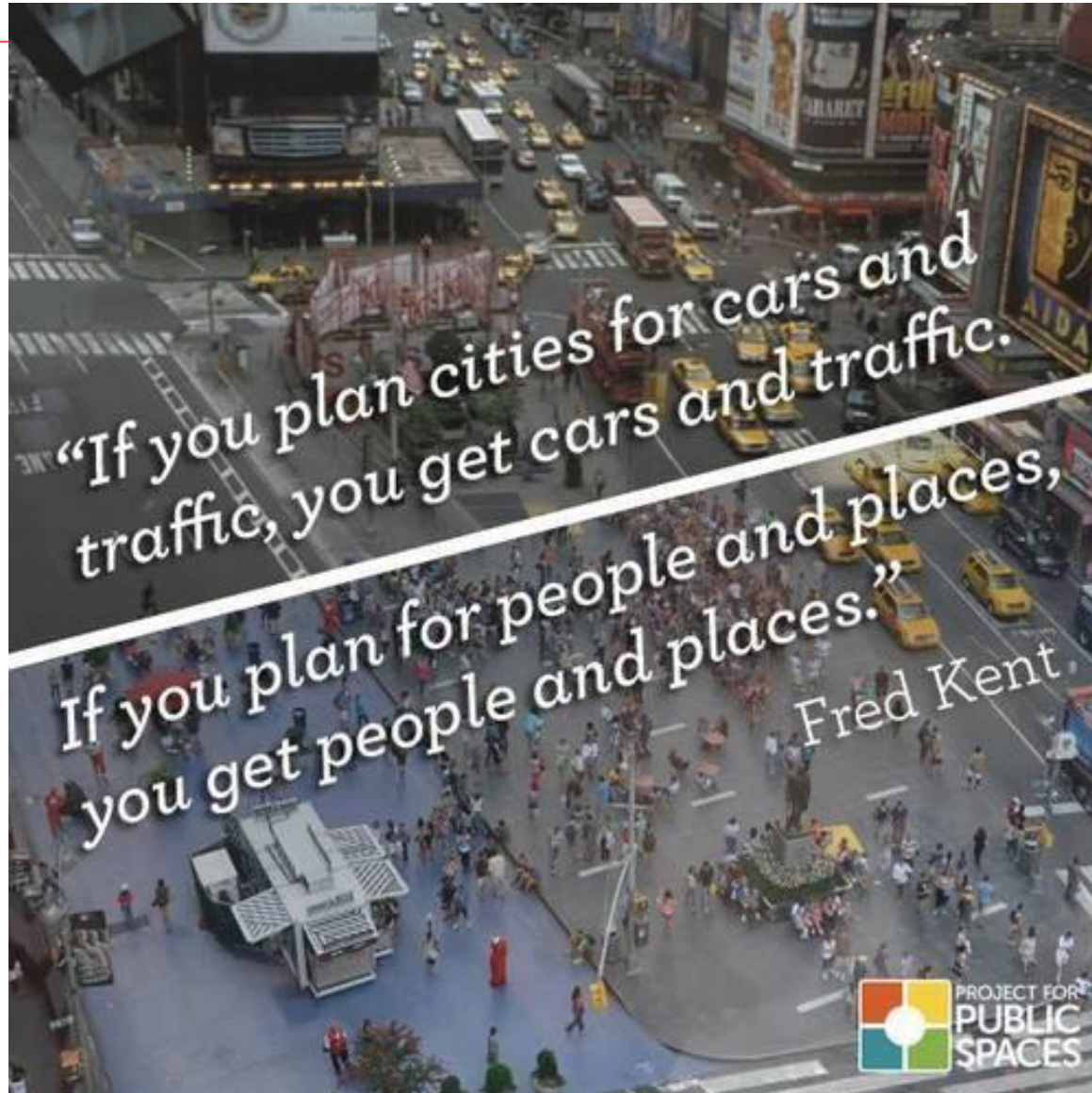
# Name some liveable cities

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- What makes them liveable?



# Placemaking



# Placemaking





# Placemaking



# Placemaking

## Cheonggyecheon, Seoul, Korea



**Before** (<http://www.kcet.org/socal/departures/landofsunshine/la-river/from-freeways-to-waterways-what-los-angeles-can-learn-from-seoul.html>)



# Placemaking

1970



2005





<http://www.kcet.org/socal/departures/landofsunshine/la-river/from-freeways-to-waterways-what-los-angeles-can-learn-from-seoul.html>



# Placemaking





# *‘Cheonggyecheon – symbol of the green economy’* President Lee



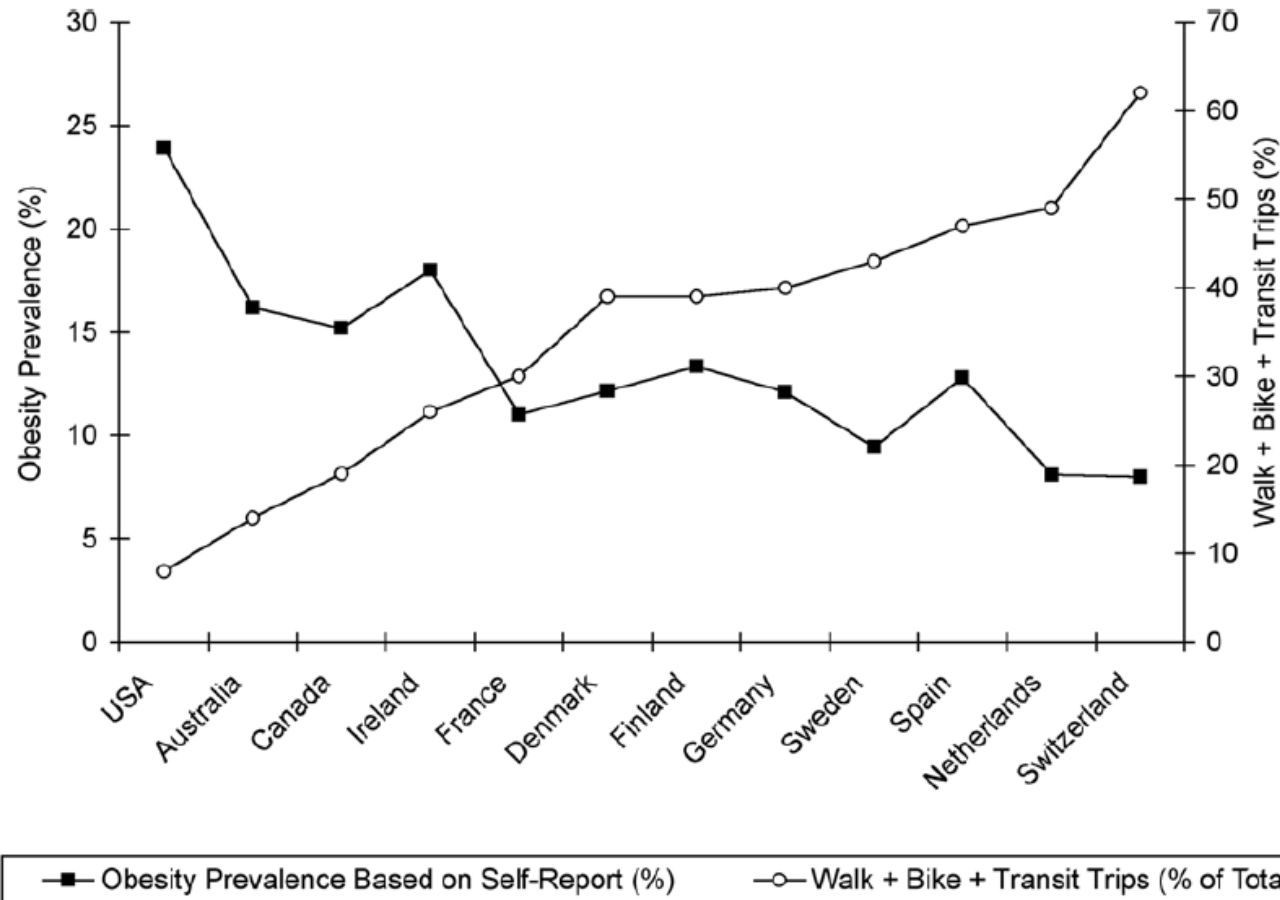


# Where did the traffic go?

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*“It just disappeared”* - Prof Jeff Kenworthy

# Co-benefits

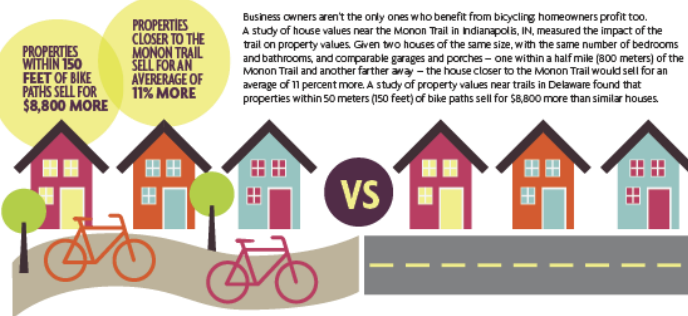


**Figure 2** — Obesity (BMI  $\geq 30 \text{ kg} \cdot \text{m}^{-2}$ ) prevalence and rates of active transportation (defined as the combined percentage of trips taken by walking, bicycling, and public transit) in countries of Europe, North America, and Australia. BMI was computed from self-reported height and weight. Data were obtained from national surveys of travel behavior and health indicators conducted between 1994 and 2006 (see text for details).

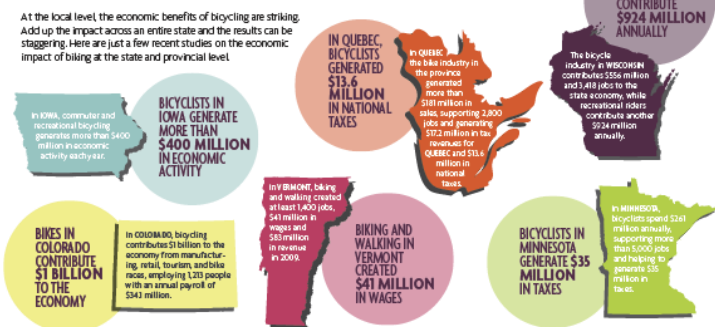


# Co-benefits

## CYCLING AND HOUSE SALES



## ROLLING UP REVENUE



## NYC CAR-CENTRIC STREETS VS



## NYC BIKE-FRIENDLY STREETS

# Co-benefits

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# Placemaking in Christchurch?

## Calmer traffic will make for a cooler city

SIMON KINGHAM

**T**he Christchurch City Council has announced it is permanently reducing the speed limit on many of the roads within the four avenues to 30kmh.

This seems to have gained a degree of negative comment with people complaining that it is going to make their journeys longer and suggesting the council is anti-car.

The reality is that for someone who chose to drive through the city centre a permanent speed limit reduction to 30kmh would have no or little impact on journey times. Even if someone were able to drive through the city centre at a consistent 50kmh then reducing their speed to 30kmh would actually only add a minute or so at most to a journey.

Even at the best of times, driving through the city centre involves stopping at traffic lights or junctions and being in traffic. And of course we are hardly at the best of times with ongoing road repairs meaning many journeys are far slower and less direct. So this speed reduction will have little impact on journey times.

It is worth mentioning that such a speed reduction dramatically improves the chance of someone surviving an accident. Very broadly, if you are hit by a vehicle travelling at 50kmh you have around a 10 per cent chance of living, at 30kmh, your chances improve to around 90 per cent.

Of course, the plans for the central city are to encourage through traffic to avoid the 30kmh roads and instead use roads that are better designed for flow traffic. This approach is common in many parts of the world, where traffic is discouraged from driving through city centres.

Although important, speed and safety are not the key issues here. The fundamental question is, what do we want our central city to be like? Back in 2011 the people of Christchurch were asked what they wanted from their city. They responded in huge numbers in the

*I doubt many Christchurch residents would dispute that pre-2011 Christchurch's city centre was not working as a destination.*

walkways, greenspace, markets, riverside features, and for it to be safe and eco-friendly. Fewer cars was also a significant theme. There was no demand for more cars, big roads and faster speeds.

We only have to see the recent attendances at the Noodle Market and Lantern Festival to appreciate that people enjoy coming into the city to attend events. Consider too the popularity of the Margaret Mahy playground.

Around the world there is a growth in the idea of "placemaking". This is not a new concept (it originated in the 1960s), but it is growing in popularity and being implemented in cities all round the globe. It is the idea that you create/design/plan public spaces so that they that promote people's health, happiness, and well-being.

The many excellent Gap Filler and Greening the Rubble projects that we find around some of our transitional spaces typify this.

I doubt many Christchurch residents would dispute that pre-2011 Christchurch's city centre was not working as a destination. Yet we have stunning botanical gardens, one of the largest central city parks in the world, a beautiful meandering river and some (albeit less than pre-2011) wonderful heritage buildings all set in a flat landscape that is perfect for walking and cycling.

**T**he buildings blocks for a great city centre are in place



Lower speed limits would make the centre city safer: if you are hit by a vehicle travelling at 50kmh you have around a 10 per cent chance of living, at 30kmh, your chances improve to around 90 per cent.

ongoing debate about the merits of some of the flagship projects and the concept of the precincts, the reduction in speed limit to 30kmh

liveable. It is also worth noting that we are not alone in implementing slower speed limits.

Hamilton along with many parts of the world. In Europe there are major campaigns to reduce speed limits

city centres. Surely a few extra seconds driving across the city is a price worth paying for a more vibrant, attractive and liveable

Simon Kingham is Geography at the University of Canterbury. Among other things, he teaches a graduate course

# In summary

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- Earthquakes impacts are a function of geography
- Where we rebuild is crucial to recovery
- Understanding interactions between human's and their environment
- The power of where



# Geography at University

- Undergraduate courses
  - part of Geography degree or other



The screenshot shows the homepage of the Masters in Geographic Information Science (MGIS) website. The browser address bar displays 'www.mgis.ac.nz'. The header features the MGIS logo and the text 'Masters in Geographic Information Science'. Below the header is a navigation menu with links: HOME, PROGRAMME, COURSES, PEOPLE, APPLY, RESEARCH, and CONTACT. The main content area is divided into two columns. The left column, titled 'LATEST NEWS', contains two articles: 'CONGRATS TO MGIS SPATIAL EXCELLENCE AWARD WINNERS' dated November 2015, and 'MGIS STUDENTS AWARDED ESRI YOUNG SCHOLAR PRIZE FIRST VUW MGIS STUDENT GRADUATES' dated 14 May 2015. The right column, titled 'WELCOME TO THE MASTERS IN GIS', contains a paragraph about the program and a small image of a building with a sign that reads 'ARUKAIA'.

Master in Urban  
Resilience and Renewal

MURR

# The power of where

## Geospatial science

- e.g. GIS, GPS, satellite imagery, drones
- .....geographical '*glue*'





# The power of where

Orange = Motor vehicle

Blue = Cycle

Green = Walk



www.linz.govt.nz

Land Information New Zealand

LINZ Data Service

Geodetic Database

Landonline



**Land Information  
New Zealand**  
*Toitū te whenua*

[About LINZ](#)

[Contact us](#)

Land

Sea

Data

Crown Property

Regulatory

# ‘The power of where’ drives New Zealand’s success

Land Information New Zealand (LINZ) makes a significant contribution to the smooth running and development of New Zealand.

So many decisions involve information about location– from finding the best use for farmland, to deciding where to build a school, to planning underground infrastructure maintenance, to deciding which route to take to work. This is information that LINZ provides.

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Support and assistance

Property information

CBD Rebuild Zone

About CERA

News

Questions and answers

Demolitions

Library

Annual Report

Better Business Cases

Cabinet papers

The Cathedral File

Chief Executive expenses

Economic indicators

Government response to draft

Central City Plan

Legislation

Maps

• CERA map viewer

• Planning and Community Toolset

Photos

Science and data

Statement of Intent

Video gallery

Wellbeing Survey

Youth Wellbeing Survey

**CERA online maps****The CERA Map**

- [The CERA Map »](#)
- [More information about the CERA map viewer](#)

This easy-to-use map viewer will run on any device. It contains the following layers of information:

- Land zone status and technical categories
- Demolition status and section 45 notices
- Prioritised routes for different travel modes from the [Accessible City](#) chapter of the Recovery Plan
- Aerial images of the city over time (including aerial pre-September 2010)
- Central City (CCDU) Blueprint and Anchor Projects.

**Planning and Community Toolset (PACT)**

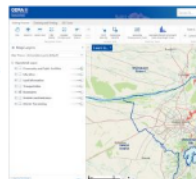
A multi-layered desktop tool showing the changes across greater Christchurch providing a raft of information including land use and zoning, transport routes, and population figures to help with future planning in the region.

The aim is to give community groups and organisations easy access to information that will help them plan their own future facilities.

- [PACT map viewer »](#)
- [More information about the Planning and Community Toolset \(PACT\)](#)

**Christchurch Central: Anchor Projects and Private Sector Prog**

This map highlights the Christchurch Central Development Unit (CCDU) Anchor Projects cost sharing split between Crown and Local Government, and features private sector recovery development happening within the

Department of Conservation  
Te Papa Atawhai

Search

Home Parks &amp; recreation Conservation Getting involved Our work About DOC Publications

**Role**You are here: [About DOC](#) > [Role](#) > Maps and geospatial services**Maps and geospatial services**

In this section:

- [Maps and geospatial services](#)
- [Geospatial data - Terms and conditions](#)
- [Natural Resource Group GIS network](#)
- [Download DOC GeoSpatial Data](#)

DOC is one of New Zealand's leading organisations in geospatial technology. Geospatial data is location-based data, and GIS (Geographic Information Systems) is a tool to manage, store, view and edit this data.

DOC has developed for public use, the following mapping tools to view and access DOC's spatial data.

**DOC Maps**

DOC Maps is designed for a broad audience including scientists, planners, Governmental agencies and teachers. It displays information on:

- DOC land, activities and facilities
- general land classifications
- property and cadastral information



Desktop

Tablet

Mobile

Related websites

Metro Info

Civil Defence

Publications

Quick Answers

A-Z Index

Glossary

Sitemap

Environment  
Canterbury  
Regional Council  
Kaunihera Talao ki Waitaha

My Services Login

Search the Environment Canterbury website...

SEARCH

ADVICE &amp; INFO

SERVICES

OUR RESPONSIBILITIES

NEWS &amp; NOTICES

GET INVOLVED

ABOUT US

Annual  
Report  
2013/14**Annual Report 2013/14**

Our latest Annual Report and Annual Report Summary are now available online.

1 2 3 4 5

**GET IT DONE ONLINE**

Contact us



Work for us



Consent search



GIS mapping

River flows  
(Latest)Irrigation  
restrictions

Active filters:

GIS

All New Zealand



Date Listed

Sort by date

Active filters:

GIS

Sort by date



Date Listed



Keywords



Location



Classification



Salary



Work Type

Clear all

### Junior CAD Consultant (Abbotsford, VIC)

Coffey International Limited

- Pivotal support role to the Spatial team
- Global professional services consultancy firm
- Abbotsford, Victoria

Real potential is uncovered only when you scratch beneath the surface

Engineering > Environmental Engineering

★ Add to shortlist

2:00 PM  
Melbourne



### Assets Engineering Officer

North Sydney Council

We are seeking a suitably qualified individual to effectively and efficiently assist in the management of Council's assets.

Government & Defence > Government - Local

★ Add to shortlist

1:38 PM  
From \$73548-\$87822pa  
+ super + 3.5% CLA + car  
Sydney  
↳ North Shore & Northern Beaches

### GIS Analyst

AECOM

- Join a global Fortune 500 organisation
- Sydney CBD location
- Supportive environment

Excellent opportunity for a Professional Spatial Information Specialist to join our Geographic Information Systems team.

Information & Communication Technology > Other

★ Add to shortlist

1:05 PM  
Sydney  
↳ CBD, Inner West & Eastern Suburbs



### Arborists - Edinburgh

Transfield Services (Aust) Pty Ltd

We are seeking an Arborist to conduct all tree inspections, mapping, reporting, trimming and felling of trees on the Defence sites.

Trades & Services > Gardening & Landscaping

★ Add to shortlist

11:17 AM  
Adelaide

### Business Analyst | GIS | CBD location

Talent International - SARA Winner Large Recruitment Agency 2014 - SEEK

- Supportive work environment

Mon 24 Nov  
Melbourne  
↳ CBD & Inner Suburbs

### Data Analyst

Hudson New Zealand

- Permanent Role
- SQL focus
- CBD Location

Permanent Data Intelligence Analyst, SQL Databases, knowledge of web applications and GIS, CBD location

Information & Communication Technology > Database Development & Administration

★ Add to shortlist

Mon 24 Nov  
Wellington  
↳ Wellington Central



### Spatial Intelligence Analyst

Hudson New Zealand

- Permanent Role
- CBD Location
- Enterprise GIS environment

Permanent Spatial Intelligence Analyst, GIS, ESRI and Integraph, enterprise analysis and modelling, some knowledge of SQL a bonus

Information & Communication Technology > Business/Systems Analysts

★ Add to shortlist

Mon 24 Nov  
Wellington  
↳ Wellington Central



### SPATIAL INTELLIGENCE ANALYST

New Zealand Fire Service

Exciting role within the NZ Fire Service, opportunity to utilise your knowledge within a supportive team and make a real difference to the business!

Information & Communication Technology > Business/Systems Analysts

★ Add to shortlist

Fri 21 Nov  
Wellington  
↳ Wellington Central

### 14/1175 - Senior Geospatial Consultant

Statistics New Zealand

- Christchurch or Wellington - Permanent
- Flexible working hours
- Internal & external training programmes on offer

A key part of this role involves engaging with internal stakeholders to ensure statistical requirements and geospatial solutions are meeting needs.

Government & Defence > Government

★ Add to shortlist

Fri 21 Nov  
Canterbury  
↳ Christchurch





# COMPUTERWORLD



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Cloud

Mobile

Social

Data

## Spatial experts added to Immigration's skills shortage list

Immigration New Zealand has responded favourably to an industry request to ease a shortage of geospatial knowledge

Stephen Bell (Computerworld New Zealand) on 12 February, 2013 20:39

# GEOGRAPHERS IN THE WORKPLACE



# Aimee Martin

'I definitely love how relevant Geography is to everything happening in the world...'



**Bachelor of Science** in Geography

**Postgraduate Diploma in Science** in Geography

**Master of Science** in Geography

**Assistant Research Analyst, Christchurch City Council**

'I definitely love how relevant Geography is to everything happening in the world, and how wide-ranging it is as a discipline,' Aimee says. 'There are so many different options and opportunities within the one subject.'

Indeed, Aimee found studying Geography at UC to be far more varied than she initially thought.

# Andreas Wilson

'I feel that I have been well prepared for the professional world...'



Studying towards a **Master of Science** in Geography

With a strong interest in health-based geography, Andreas' studies at UC have focused on urban communities and its impact on the health of people.



# Joshua Neville

'Despite how intensive it is, the work is really engaging and enjoyable...'



**Bachelor of Science** in Geography

Studying towards a **Master of Science** in Geography

Choosing to study Geography was a choice inspired by living in Christchurch during a time of dramatic change to

# Penny Goddard

'My studies have helped me understand what I am seeing in the landscape as I have travelled and worked...'



**Bachelor of Science** in Geography

**Avalanche Forecaster, Canadian Avalanche Centre, Revelstoke, Canada**

Only the third New Zealand woman to reach the summit of Everest, Penny feels very fortunate. 'Everything came together for me and I got to experience this amazing thing,' she says.

It was just one year before her summit that Penny was in Nepal and first considered the idea.



# Geographers in the workplace



Emma Kelland,  
CERA,  
Rebuild



Gareth Taylor,  
Jacobs,  
Environmental  
Consultant



Anthea Fiolitakis,  
HERE Maps,  
Geographic Analyst



Mallory Kindred and Astoria Delaney  
Statistics NZ, GIS analysts



Anne Heins  
ECan,  
Public Transport  
Planner



Hayley Hume-Merry,  
ECan  
GIS Data Officer



Iain Dawe,  
Greater Wellington,  
Senior Hazards  
Analyst



Justin Cope,  
ECan,  
Team Leader Hazards  
& Coastal



Hamish Kingsbury,  
Interpret Geospatial  
Solutions, Consultant